

TO DETERMINE THE EFFICACY OF HEADINGS IN THE REPRESENTATION OF CLINICAL DATA.

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Abstract-during the autumn of 2000, 80 clinicians took part in a study to test a set of Clinical Headings developed to facilitate clinical communication. Real-world patient scenarios were used to develop a simulator to test current and re-structured clinical documentation. The relationship between perceived use and actual results was explored. The project raised awareness of the important issues from the clinical perspective on the introduction of Headings in electronic clinical notekeeping.

Keywords – clinical, data, documents, informatics, structure, Headings.

I. INTRODUCTION

There is a history of poor communication between primary and secondary care in the UK clinical environment. Clinical documents do not always contain the information that recipients require to support clinical practice. The document Information for Health [1] recognised the need for improved management of information within clinical documentation. The NHS Plan [2] reinforces this viewpoint and sets targets for 75% of hospitals and 50% of primary and community trusts to have implemented an electronic patient record system by 2004 to level 3 which will support electronic prescribing, integrated care pathways, order communications and result reporting. This commitment to creating an infrastructure will ensure that patients as well as clinicians will have access to information relating to treatment and planned care.

The development of a nationally implemented Electronic Health Record (EHR) and Electronic Patient Record (EPR) will facilitate patient centred care as envisaged in the NHS Plan. Patients will not only have access to the information held in their medical records but also will be able to control and monitor clinicians access. A recognised benefit will be the development of an infrastructure to support communication across organisational boundaries. Traditionally communication between primary and secondary care has been predominately paper based. Recipients complain that they cannot read handwriting, the information contained in the document is not appropriate to the clinical need at that moment in time and that too large a percentage of documents, especially discharge letters do not reach the intended recipient.

The UK situation, prior to implementation of the EHR/EPR indicates a fragmented approach to system

development and implementation from both primary and secondary care perspectives. The need for national standards is evident. In order to facilitate effective communication across organisational boundaries it is essential that standards for document structure are developed and tested. It is from this perspective that the development of the UK government-funded initiative to develop a set of Clinical Headings has emerged.

A Loughborough University based project to test the Headings in a clinical environment took place between April 1999 and January 2000. The project brought together healthcare informatics professionals from the academic, commercial and public sectors who were able to demonstrate considerable experience in the representation of clinical data in both the EPR and EHR setting. Winchester and Eastleigh Healthcare NHS Trust (WEHCT) were the clinical partner for the project. The Trust provides a complex variety of hospital and community health care for 220,000 people living in central Hampshire. The Royal Hampshire County Hospital (RHCH), located in Winchester, is the main acute hospital for the area and has over 500 beds. Health centres and GP surgeries throughout the area are the base for a broad range of Trust staff working throughout the community. WEHCT pioneered the development of the Integrated Clinical Record, (ICR). Whilst much work has been done in developing paper-based multidisciplinary noting, the Winchester development was the first effort in Europe to develop such a method of documentation using electronic means.

II. METHODOLOGY

The project focused on two main areas:

A. Coverage and Reliability of data input. Issues addressed included:

- Can all key items of data appearing in clinical record and communication documents be readily and unambiguously placed under one Heading?
- How long does this take to carry out compared with writing a conventional document?
- Do different clinicians place the same item under the same Heading (between-observer reliability)?
- Does the same clinician place the same item under the same Heading on a second occasion (within-observer reliability)?

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B. Ease of finding and interpreting data items: Issues identified included:

- Can clinicians readily locate and retrieve key items of patient data appearing in clinical records and communications from documents re-structured using the Headings?
- Do they make the same inferences about the patient's state when the document is structured using the Headings as when it is structured the usual way?
- How long does this take, compared with reading and interpreting a conventional document?

The crucial dimension for the study was to compare and contrast the use of the Headings with established practice by employing a blend of qualitative and quantitative methods. During the autumn of 2000, 80 clinicians (67 nurses and 13 doctors) working within WECHT were randomly selected to take part in the study in order to test the set of Headings. Eight real-world patient scenarios were used, covering four clinical areas: stroke, colonic surgery fractured neck of femur and elderly rehabilitation. The four groups of patients were identified to reflect current research priorities and include chronic and acute conditions that each has a different economic burden on the Trust and the wider healthcare community. Six Clinician types were identified (Consultants, Registrars, House Officers, Ward Based Nurses, Specialist Nurses and Community Nurses). Inclusion of a community nurse enabled the study of communications and use of Clinical Headings that cross the organisational boundary between secondary care and health care in the community. Four documents for each patient were identified (multidisciplinary assessment form, multidisciplinary discharge document, a doctors full discharge letter and a doctors clerking document). A task analysis simulator was developed to test the use of local documentation and clinical documents restructured using the Headings.

The analysis of the data comprised three different perspectives: questionnaire analysis, task analysis and interview analysis. The inclusion of a questionnaire allowed clinicians to record their perception of a range of issues that surround the development and use of Headings. The task analysis simulator was designed to replicate an electronic clinical notekeeping system providing access to local and Headings documents. Selected clinicians were asked to use the simulator to record their clinical profession, association with patient type, clinical bleep number and work phone number. The clinician were then asked to select a task (input or retrieval) and patient from one of two clinical scenarios. The clinician then carried out a series of pre-determined tasks. These tasks were repeated using a second patient scenario. Interviews were then organised to discuss emergent issues from the task analysis aspect of the project.

III. RESULTS

A. Questionnaire Analysis

The gender distribution of participants was 13.8% male and 86.2 % female. The gender distribution of Medical staff interviewed (Consultants, Registrars and House Officers) was 69.2% male and 30.8% female. This closely mirrors the national average (66.1% male and 33.9% female) [3]. The gender distribution of nursing staff interviewed was 3% male and 97% female. The number of female nurses interviewed was slightly higher than the national average (11.5% male and 88.5% female). Responses indicate that 96% of clinicians (n=77) use a computer at work. The 4% (n = 3) who do not use a computer at work are Doctors. Furthermore, 56% of clinicians use a computer at home. To elicit patterns of use of computers by the clinicians taking part in the task analysis process, further questions were asked about use of software packages. The applications that were most used on a daily basis were email (26.3%) and word processing (16.3%). The World Wide Web was used weekly or more often by 41.3% of clinicians, a weekly rate of use (10.1%) for spreadsheets and for 7.5% for database packages. Almost two-thirds of the clinicians admitted that they never play computer games.

On completion of the task analysis clinicians were asked to record their perceptions, relating to the time taken to input clinical data into both local documents and the same documents restructured using Headings. The data collected allows comparisons between perceptions and actual results from the task analysis process. As expected, 61.2% of clinicians (n= 49), thought that it had taken them longer to input information into the Headings documents. Familiarity with local document structure was the prevailing reason for the impression that inputting information to the local documents took less time. The clinicians were more evenly divided when deciding if the retrieval of information took longer from the local or Heading documents. 46.2 % (n=37) thought that it took them longer to retrieve information from Headings documents, compared with 38.8% (n=31) who thought retrieval from local documents was quicker. Interestingly, 15% (n=12) of clinicians thought that retrieval was about the same time for both documents. Several clinicians commented that the layout of the Headings document helped to aid navigation around the document, and therefore identification and retrieval of requested information was perceived to be quicker.

B. Task Analysis

The research team identified clinical data that would be found in the four documents selected for the task analysis process. In total, nine questions were formulated, several of which were common to more than one document. Clinicians were then asked to record three items of clinical data in a document (1st Heading, local document, 2nd Heading). The three data items used for the task depended upon the clinicians

initial document selection. Several clinicians appeared to hesitate when presented with certain items of clinical data and expressed reservations about only placing data under one Heading. Several clinicians sought clarification from the research team that it was 'okay' to place information in more than one place. This issue arose when recording items of clinical data that related to information about a patient's condition, such as 'this patient is diabetic' or 'this patient is epileptic'. This information was recorded under a Heading and then under a second Heading such as Alerts or Problems.

Investigation of the perception of time taken to input data into both local WECHT documents and Headings documents compared with actual time taken show that 30% of clinicians thought that data entry had taken longer for local WECHT documents, whereas in reality the figure is 45%. This difference between actual and perceived time taken may be explained by the fact that clinicians were familiar with local documents. However, the actual time taken suggests that the structure and layout of the Headings documents may have facilitated the expediency of data entry. These results do not reflect the accuracy and precision of clinical data being correctly placed within a Heading.

During the task analysis process clinicians did not always take the opportunity to scroll through the whole document before selecting a Heading to record information. At the end of the data input exercise several clinicians asked if they could delete information from the selected Heading and relocate it. This request was due to clinicians failure to become aquatinted with all the available Headings combined with the limited number of Headings that were displayed on the screen at any one time. Clinicians commented that they would benefit from more time to familiarise themselves with the Headings, as not all were intuitive or self-explanatory. During the data input aspect of the task analysis several clinicians suggested that, dependent upon the document and the ultimate recipient of the document, only relevant Headings be used. It was thought that this would facilitate communication between secondary and primary care.

Clinicians appeared to be more comfortable inputting data into documents. The majority were familiar with the local headings but even taking this into consideration, there was a variation in the headings used to record information. Clinicians were asked to record the same three items of clinical data in a second Heading document. 61% (n=49) of clinicians placed the same item under the same Heading on the second occasion.

Investigation of the perception of time taken to retrieve information from both local WECHT documents and Headings documents compared with actual time taken show that 40% of clinicians thought that information

retrieval had taken longer for local WECHT documents, whereas in reality the figure is 22.5%. This difference between actual and perceived time taken may be explained by the clinicians familiarity with local WECHT documents, this may have facilitated the expediency of information retrieval.

Clinicians were asked to carry out a second task relating to retrieval of information from two documents (one local WECHT and one restructured document using the Headings). The results indicate that retrieval from local documents is quicker and may be explained by clinicians familiarity with the local documents. Many clinicians remarked that the Headings documents appeared to be more user-friendly than the WECHT documents. Retrieval of information from Headings documents was facilitated by clearer document design.

C. Interview Analysis

Eight clinicians (3 doctors, 5 nurses) were interviewed to discuss the emergent themes from the task analysis process. Six main themes emerged:

- The use of abbreviations and symbols - the majority of clinicians interviewed thought that the use of abbreviations and symbols were a practice that should be discouraged, although it was acknowledged that they were currently used to save time.
- Use of Headings from a clinicians perspective- The clinicians acknowledged that the introduction of Headings would inevitably lead to a change in the way clinicians work. The resulting change in clinical practice was seen as a welcome progression. The clinicians felt that there would be some initial resistance to change, but this would diminish as familiarity with document structure increased.
- Effect of Headings on patient care - it was felt that the Headings would facilitate patient care in several areas including facilitating the clinical assessment process, the signposting of a clear list of clinical problems, the ability to support the path to a logical conclusion about a patient's state of health, reduce the instances of 'lost communication', and, support the fluid care of patients.
- Communication across organisational boundaries- clinicians felt that the use of Headings within clinical documents would ensure that clinicians communicating across primary and secondary care would be able to access the information that they required more effectively.
- Data manipulation and flexibility- the clinicians acknowledged that individual clinicians' information requirement within a defined time frame changes depending on a patients state of health. All the clinicians varied on how they would like to see clinical data represented especially in the area of test results and

observations. There was a general acceptance that the ability to manipulate the data into an acceptable format for individual clinicians would be welcome.

- Inclusion or exclusion of Headings that contain no clinical data-several clinicians indicated that they would not expect information in all Headings, especially if they felt that it did not fall within their role to collect the specific data. Some indication of whether a negative response to questioning the patient would be welcomed by some clinicians and others felt that only headings that contained data should be included in the document.

IV. DISCUSSION

Participants were concerned about the time taken to input data and retrieve information from Headings documents. Although not an issue that is directly associated with the development of Headings, clinicians who currently enter data on paper documents are concerned that inputting clinical data into a computer will take much longer, but at the same time acknowledge that the use of Headings speeds up information retrieval. This is an important finding as the aim of any clinical record system should be to facilitate the rapid retrieval of information and reduce the level of errors. [4]

The participants accepted a degree of structure within clinical documents and the benefits that this may bring to clinical practice. Current practice obviously affects this viewpoint. Clinicians need to be able to manage patient information and access that which is required in a timely manner. They are currently disappointed with the inability to manipulate and adapt data formats. Clinician perceptions of information overload are exacerbated by the lack of flexibility in relation to clinical data that current electronic clinical noting systems are able to support.

The use of an electronic hospital information system in Winchester for clinical notekeeping appears to be almost complete, and has received support from the majority of clinicians. Both positive and negative views were expressed by clinicians based on their experience of using the WECHT Hospital Information System. The majority of clinicians recognised the need to move away from dual data entry (paper and electronic) to data entry based solely on an electronic system. As a result, there was an acceptance that in order to accomplish this change, further development of personal computer skills would be required in the clinician population.

The issue of the order of the Headings within a document is one that appears to require further investigation. Essential data must be clearly represented within a document structure [5]. Many clinicians were quite insistent that the Headings should

appear in a standard order with Alerts and Problems always at the beginning of the document.

The key to successful adoption of a structure within clinical documents is dependent upon clinicians inputting the right information in the right place, this will then facilitate the expedient retrieval of clinical information.

V. CONCLUSION

This study provides a snapshot of the use of Headings in a clinical setting by clinicians that possess a degree of experience using an electronic patient record keeping system.

Anecdotal evidence from observation of the task analysis process indicates that some clinicians were more comfortable than others in completing the tasks. The corollary to this was the inclusion of clinicians that crossed organisational and professional boundaries, giving a rich source of different opinions.

Clinical record keeping in the NHS is clearly in a state of transition. The change from paper based clinical noting to electronic systems will go some way to the facilitation of communication across professional and organisational boundaries. The introduction of a common set of Headings will require all stakeholders in the process to engage in further discussion.

This project raised important issues from the clinical perspective on the introduction of Headings in electronic clinical notekeeping. To take advantage of the interest generated, it is hoped that the introduction of Headings can provide a timely intervention in the debate surrounding clinical communication.

REFERENCES

- [1] Information for Health. London: NHS Executive, 1998
- [2] The NHS Plan. A plan for investment: a plan for reform. London: Stationery Office, 2000
- [3] NHS Hospital and Community Health Services: Directly employed staff by sex at 30 September 1999. Available at http://www.doh.gov.uk?HPSSS/TBL_D3.HTM
- [4] Wyatt, JC, Wright, P. Medical records: design should help use of patient data. *The Lancet*. 1998; 352: 9137.
- [5] Nygren, E, et al. Medical records: Helping clinicians to find data and avoid delays. *The Lancet*. 1998; 352: 9138.